CLAIMS

1   1. A method for uniformly distributing data transmitted by a server over a plurality of un-

2   derlying links of an aggregate within a computer network, the method comprising the

3   steps of:

4   defining a unit of data as a datagram;

5   apportioning each datagram into at least one fragment at the server;

6   associating each fragment to an underlying link of the aggregate on the basis of an

7   Internet protocol (IP) identifier (ID) of each datagram and a number of active links of the

8   aggregate; and

9   transmitting the fragment over its associated underlying link from the server to the

10   computer network.

1   2. The method of Claim 1 wherein the step of associating comprises the step of produc-

2   ing a result representing a remainder upon dividing the IP ID by the number of active

3   links.

1   3. The method of Claim 2 wherein the step of associating further comprises the steps of:

2   calculating the IP ID of each datagram in a sequential manner; and

3   rotating the fragments of each datagram among all the underlying links to thereby

4   ensure that all fragments having the same IP ID are provided to the same physical link of

5   the aggregate.

1   4. The method of Claim 1 wherein the step of associating comprises the steps of:

2   logically combining the IP ID with a predetermined mask to produce a quantity;

3   right shifting the quantity a predetermined number of places; and

4   establishing a threshold at which a group of data is forwarded to each underlying

5   link of the aggregate.

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1   5. The method of Claim 4 wherein the step of associating further comprises the step of

2   producing a result representing a remainder upon dividing the right shifted logically

3   combined quantity IP ID and predetermined mask by the number of active links.

1   6. The method of Claim 5 wherein the IP ID is a 16-bit value, the predetermined mask is

2   0xFF80 and predetermined number of right shifted places is 7, and wherein the group of

3   data comprises 128 IP IDs.

1   7. The method of Claim 6 wherein the group of data comprises one of 128 different

2   transport control protocol (TCP) fragments and 128 different user datagram protocol

3   (UDP) datagrams.

1   8. The method of Claim 7 wherein each UDP datagram comprises up to 23 fragments.

1   9. The method of Claim 1 further comprising the steps of:

2   loading at least one data buffer of the server with the at least one fragment;

3   fetching the fragment from the data buffer; and

4   loading at least one queue of the server with the fragment, the queue associated

5   with the underlying link.

1   10. A system adapted to uniformly distributing data over a plurality of underlying links

2   of an aggregate within a computer network, the system comprising:

3   a processor;

4   a memory coupled to the processor and having locations addressable by the proc-

5   essor;

6   an operating system resident in the memory locations and executed by the proces-

7   sor, the operating system configured to implement a modified load balancing technique

8   that defines a unit of data as a datagram, the operating system comprising an Internet

9   Protocol (IP) layer that apportions the datagram into at least one fragment, the operating

10   system further comprising a virtual interface process that associates the fragment to an

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11 underlying link of the aggregate on the basis of an IP identifier (ID) of the datagram and

12 a number of active links of the aggregate; and

13   at least one network adapter coupled to the memory and processor that cooperates

14 with a network driver of the operating system to transmit the fragment over the associated

15 underlying link to the computer network.

1 11. Apparatus for uniformly distributing data transmitted by a server over a plurality of

2 underlying links of an aggregate within a computer network, the apparatus comprising:

3   means for defining a unit of data as a datagram;

4   means for apportioning each datagram into at least one fragment at the server;

5   means for associating each fragment to an underlying link of the aggregate on the

6 basis of an Internet protocol (IP) identifier (ID) of each datagram and a number of active

7 links of the aggregate; and

8   means for transmitting the fragment over its associated underlying link from the

9 server to the computer network.

1 12. The apparatus of Claim 11 wherein the means for associating comprises means for

2 producing a result representing a remainder upon dividing the IP ID by the number of

3 active links.

1 13. The apparatus of Claim 12 wherein the means for associating further comprises:

2   means for calculating the IP ID of each datagram in a sequential manner; and

3   means for rotating the fragments of each datagram among all the underlying links

4 to thereby ensure that all fragments having the same IP ID are provided to the same

5 physical link of the aggregate.

1 14. The apparatus of Claim 11 wherein the means for associating comprises:

2   means for logically combining the IP ID with a predetermined mask to produce a

3 quantity;

4   means for right shifting the quantity a predetermined number of places; and

5   means for establishing a threshold at which a group of data is forwarded to each

6   underlying link of the aggregate.

1   15. The apparatus of Claim 14 wherein the means for associating further comprises

2   means for producing a result representing a remainder upon dividing the right shifted

3   logically combined quantity IP ID and predetermined mask by the number of active links.

1   16. A computer readable medium containing executable program instructions for uni-

2   formly distributing data transmitted by a server over a plurality of underlying links of an

3   aggregate within a computer network, the executable program instructions comprising

4   program instructions for:

5   defining a unit of data as a datagram;

6   apportioning each datagram into at least one fragment at the server;

7   associating each fragment to an underlying link of the aggregate on the basis of an

8   Internet protocol (IP) identifier (ID) of each datagram and a number of active links of the

9   aggregate; and

10   transmitting the fragment over its associated underlying link from the server to the

11   computer network.

1   17. The computer readable medium of Claim 16 wherein the program instruction for as-

2   sociating comprises a program instruction for producing a result representing a remainder

3   upon dividing the IP ID by the number of active links.

1   18. The computer readable medium of Claim 17 wherein the program instruction for as-

2   sociating further comprises program instructions for:

3   calculating the IP ID of each datagram in a sequential manner; and

4   rotating the fragments of each datagram among all the underlying links to thereby

5   ensure that all fragments having the same IP ID are provided to the same physical link of

6   the aggregate.

1   19. The computer readable medium of Claim 16 wherein the program instruction for as-

2   sociating comprises program instructions for:

3   logically combining the IP ID with a predetermined mask to produce a quantity;

4   right shifting the quantity a predetermined number of places; and

5   establishing a threshold at which a group of data is forwarded to each underlying

6   link of the aggregate.

1   20. The computer readable medium of Claim 19 wherein the program instruction for as-

2   sociating further comprises the program instruction for producing a result representing a

3   remainder upon dividing the right shifted logically combined quantity IP ID and prede-

4   termined mask by the number of active links.